TRANSLATION

SCLERODERMA-LIKE SKIN CHANGES, RAYNAUD'S SYNDROME, AND ACRO-OSTEOLYSES IN WORKERS IN THE PVC MANUFACTURING INDUSTRY.

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Since 1963 there have been reports from abroad of a syndrome which occurs in people working on autoclaves in the polymerization of vinyl chloride [1-3, 8, 9].

Until the spring of this year no observations from Germany have been available. Then, in March 1972, we made a similar diagnosis in two autoclave workers employed in a factory manufacturing PVC [4].

In our present total of 7 patients the first symptoms appeared 1 to $3^1/_2$ years after starting work as an autoclave worker. The complaints were an increased sensitivity to cold, formication, numbness and pallor of the fingers, tenderness in individual fingertips, and thickening and feeling of tension in the hands. These were followed later by distension of end-phalanxes and changes in the nails. In addition, there was one complaint of reduction in vision, one of pain in the epigastrium and one of giddiness.

During the clinical examination Raynaud's syndrome was found in varying stages of advancement in 5 patients (the only symptom in two patients), and also in 5 patients individual end-phalanxes were thickened with simultaneous shortening and deformation of the nail plates, the latter for the most part assuming a watchglass shape. Further characteristics (observed in 5 patients) were swollen fingers, and nodular infiltrations on the extensor surfaces of the fingers, the back of hands, and distally of the olecranon (Fig. 1). In 4 patients there were ivory-colored infiltrations, with a trabecular structure, in the distal third of the flexor sides of the forearm. 3 patients showed rather puffy, masklike

features accompanied by flat indurations in the upper cheek area.

Bone alterations were found in 5 of the 7 patients: band-like osteolyses of the end-phalanxes in the transition of the processus unguicularis to the diaphysis as well as shortening and/or thickening of the end-phalanxes of the fingers in question. The 1st, 2nd, and 3rd fingers of both hands were the ones mainly affected by the change, and the clinical and X-ray changes correlate (Fig. 2)*

Clinical internal examinations and the clinical and chemical results compiled indicated disturbances of the liver function in two patients and an obstructive ventilation disturbance in one. These still require further clarification. Arteriography was carried out on both arms of two patients. In one of them this revealed a blockage of the interosseous artery to the left above the wrist joint and strikingly thin calibers of the radial and ulnar arteries (Findings: Prof. Schlüssel, Municipal Hospital, Siegburg). Quantative analyses of IgG, IgA, IgM and complement fraction β_1A as well as tests for antinuclear factors, L.E. cells, and rheumatoid factors on four patients did not indicate any auto-aggression disorder.

The histological findings on skin samples in 3 patients corresponded to the early inflammatory stage of a progressive scleroderma.

The clinical symptoms of the disease also resemble the early stages of progressive scleroderma. However, there are the following distinguishing factors [5,6]: 1) relatively frequent appearance of the syndrome as compared with scleroderma, 2) restriction of the syndrome to men; 3) absence of important early symptoms such as shortening of the frenulum of the tongue and esophagus sclerosis; 4) thickening and shortening of the end-phalanxes (fingers become atrophied and more conical with progressive scleroderma); 5) almost regular occurrence of acro-osteolyses, which is rare in progressive scleroderma [7,10].

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* For Figs. 1 and 2 see the plate on p. 2a

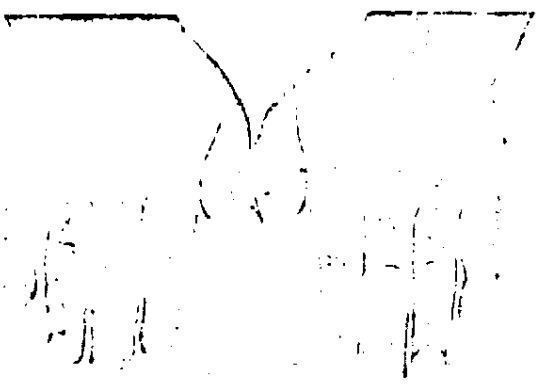

Fig. 1 - Thickening of the end-phalanges, similar to drumstick finger, in all 5 fingers of the right hand and in the 1st and 3rd of the left hand; shortening of the nail plates which have also assumed a watchglass shape. Diffuse swelling in both hands and plate-like infiltrations on the backs of both hands

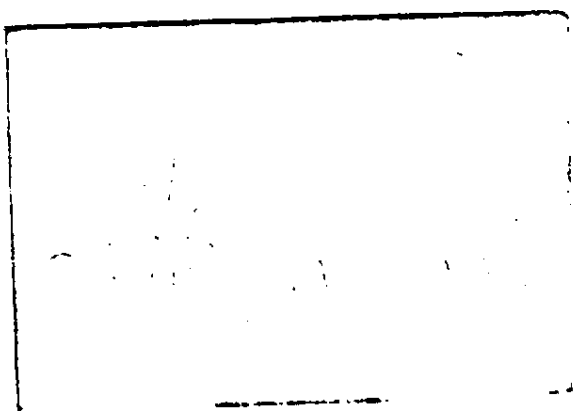

Fig. 2 - X-ray of both hands (patient of Fig. 1); band-like osteolyses of the end-phlanges of all 5 fingers of the right hand and of the 1st and 3rd of the left hand in the transition of the processus unguicularis to the diaphysis.

The decisive characteristics remain, however, the link with the patient's occupation, present in every case, and the rather mild prognosis, which manifests itself in a clear involutional tendency of the skin changes, and to a smaller extent of the bone changes (observation of progress over 10 years).

The pathogenesis of the disease picture has not yet been clarified.

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SPECIFIC FEMALE ORGANISM FUNCTIONS IN WOMEN ENGAGED IN [redacted]RODUCTION

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The widespread introduction of automation and mechanization into production processes and improvement in the technology have made it possible for women to take part in nearly all of the ramifications of the national economy. Consequently, an important problem is a study of the effect of production conditions on the female organism as a whole and on its specific functions, in particular. The involvement of women in production processes confronts the hygienists and gynecologists with the important problems of studying the working conditions of the women, a study of the specific functions of the female organism, and also the development of health measures.

Recent studies have shown that many factors in the production area affect the functions of the female organism. This refers primarily to the menstrual and genital functions and gynecological ailments (S. V. Levchuk, 1966; O. I. Barsukova, 1967; V. G. Matysyak, 1967; V. K. Yaroslavskii, 1970).

In connection with the expanded production of plastics the working conditions and the health of the workers in this branch of the chemical industry are constantly becoming more frequent objects of study by hygienists, clinicians, and occupational pathologists.

P. 105 However, only some of the problems in the indicated field have been discussed fully. This is especially true as regards the effect of [redacted]on the female organism.

Polyvinyl chloride is a basic component in the production of plastics. It is the polymerization product of vinyl chloride. Valuable plastics, which find broad use in various branches of the national economy, are formed by the copolymerization of vinyl chloride with other compounds, and also by chemical modification.

The process for the production of plastics consists of preparing the raw material, mixing the components, milling, separation, heat treatment, and molding.

P. 106 Since polyvinyl chloride is subjected to heat treatment, the entrance of its decomposition products into the air can be expected. However, more frequently vinyl chloride is either absent or else it is present only in small amounts. Consequently, polyvinyl chloride dust must be regarded as being the main unfavorable factor that is common for the entire production (Yu. I. Vertkin, 1970).

As was shown by N. I. Karpova (1967), polyvinyl chloride dust is always present in the air of the working area, and at times it exceeds the permissible limits.

Some communications exist on the effect of polyvinyl chloride on the human organism. Thus, the data of V. G. Artamonova and coworkers (1967) testify to the fact that about half of the examined workers, who came in contact with polyvinyl chloride, complained most frequently of headaches, indisposition, sleep disturbance, disagreeable sensations around the heart, and at times loss of memory. In the objective study the attention was attracted to the

P. 106 symptoms of the disturbances of the central nervous system with the phenomena of vegetative disfunction. The fact that the workers (97% of which were women) had the same type of complaints, combined with the objective symptoms, made it possible to conclude that the disclosed pathology is related to the unfavorable effect of occupational factors.

If some information exists on the effect of polyvinyl chloride on the human organism, then we were unable to find any data in the literature available to us on the effect of this compound on the specific functions of the female organism.

We made a study of the menstrual and genital functions and of the gynecological ailments of 130 female workers in a chemical plant who had contact with polyvinyl chloride. The control group represented 100 female workers who were not exposed to this substance. The method of study consisted in studying the general, occupational and obstetric anamnesis, bimanual examination, and also in taking smears from the posterolateral fornix in order to ascertain the cytological picture of the vaginal region. The obtained anamnestic and objective data were recorded in special questionnaires that had been developed by the Department of Obstretics and Gynecology of the LSGMI.

The age contingent of the female workers was as follows: the largest group or 54 persons were 40 - 45 years old, 37 of the women ranged in age from 31 to 40 years, 19 were age 46 - 50 years, 16 persons had an age of 20 to 30 years, and four female workers were over 50 years old. Of these test persons, 78 women worked as operators, 28 women operated the mills, and 24 persons were engaged

P. 107 in other operations.

The work experience was as follows: 36 of the women had up to 5 years of experience, 38 had a work experience of 5 to 10 years, and 56 of the test persons had a work experience greater than 10 years. As a result, the studied contingent consisted mainly of workers ranging in age from 30 to 45 years and with a work experience greater than 10 years.

The effect of industrial factors on the menstrual function of female workers is confirmed by numerous studies. Thus, it was established by Kh. E. Murzalieva and O. A. Sheremet (1960) for women workers in the lead industry that the changes incurred in the menstrual cycle are on the type of hypermenorrhea, oligomenorrhea and metrorrhagia. It was observed by N. S. Tolchinskii (1967) for women workers in the same industry that in 12% of the cases the women experienced the same disturbances of the menstrual function. A. P. Belyaeva (1966) detected various disturbances of the menstrual cycle for women working in the antimony industry in 47.5% of the cases. Of all of the types of disturbances, menorrhagy and the hypomenstrual syndrome occupied a prominent position.

A study of the menstrual function for the women workers examined by us, who had been exposed to polyvinyl chloride, disclosed that hypomenorrhea was incurred by 15.2%, and hypermenorrhea by 22.1% of the women. Oligomenorrhea was detected by us for 42 of the workers (32.1%), and polymenorrhea for 7 women (5.3%). In the control group these indices were somewhat lower, but the statistical differences were insignificant ($P > 0.05$). It is important to mention

P. 107 that irregular periods were encountered for 9.1% of the women in the main group, whereas in the control group acyclic menses occurred for 1% of the test persons ($P < 0.05$). In addition, the attention is attracted to the fact that while working in the given industry the periods became copious for 2.3% of the workers, and painful for 3.1%.

The following data were obtained for the genital function of the test women. In the main group the number of women who had been pregnant was 522, and 26.3% of these pregnancies had ended in normal births. Premature births were observed in 0.5% of the cases, while 3.3% of the women had spontaneous abortions. As a result, based on the results of our studies, the failure to carry to term was 3.8%.

P. 108 Based on the data of various authors, the frequency of the premature spontaneous termination of pregnancy (abortions and premature births) varies from 10 to 13% (I. A. Petrova, cited from S. M. Bekker (1964)). The results obtained by us are considerably lower than the data given by other authors. In the control group the premature termination of pregnancy occurred for 5.3% of the women (i. e. smaller than in the main group of workers by 1.5%), which indicates that the given plastics industry fails to exert a harmful effect on the ability to carry to term.

A large percent of the artificial abortions must be explained by the age of the examined group of workers, where the predominant group ranged in age from 35 to 45 years.

An important criterion of the genital function is the number of pregnancies and births incurred per woman worker. In the main group the number was 3.9 pregnancies and 1.9 births per worker,

P. 108 and respectively 3.7 and 1.7 in the control group. According to the studies of E. I. Kachetova (1963), in the viscose industry the number was 3 - 4 pregnancies and 1.6 births per worker, i. e. the results of our study are in agreement with the previously obtained data.

The data of the gynecological examination disclosed that in the main group ailments of the sex organs occurred in 44% of the cases. Inflammatory ailments of the genitalia were encountered most frequently (16.7%). Polyps and erosion of the neck of the womb were detected for 13.4% of the women. In the control group of test persons these indices were respectively equal to 23% and 17% ($P > 0.05$). Prolapse of the sex organs and benign tumors of the uterus were observed to equal degree (8.3% and 6%) in both groups.

[redacted] This is indicated by the greater frequency of acyclic menses in the main group of test persons.

A further study of the specific functions of women who come in contact with various kinds of polymers while working, as well as experimentally ascertaining the effect of the latter on the generative function, will make it possible to expand our concepts regarding the effect of polymers on the female organism.

As a result, a study was made of the specific functions of the female organism for 230 women engaged in the production of polymers. A certain disturbance of the menstrual function was observed, which

P. 109 was manifested as irregular monthly periods (for 9% of the women). We failed to detect any special changes in the genital function or an increase in the gynecological ailments for women workers exposed to polyvinyl chloride.

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